THE PRODUCTION OF LOW-ENERGY NEUTRAL OXYGEN BEAMS BY GRAZING-INCIDENCE NEUTRALIZATION

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The Vanderbilt University neutral oxygen beam facility produces beams of low-energy neutral oxygen atoms by means of grazing-incidence collisions between ion beams and metal surfaces. Residual ions are deflected by applied electric fields. This unique method can utilize initial ion beams of either O^+ or O_2^+ since a very large percentage of molecular oxygen ions are dissociated when they undergo grazing-incidence neutralization. The method of neutralization is applicable to low-energy beams and to all ions. Our research places particular emphasis on O and N_2 beams for simulation of the low earth orbit space environment. Since the beam is a pure O-neutral beam and since measurements of the interaction of the beam with solid surfaces are made spectroscopically, absolute reaction rates can be determined. The technique permits the beams to be used in conjunction with electron and photon irradiation for studies of synergistic effects. Comparisons of optical spectra of Kapton excited by 2.5-keV O, O^+ and O_2^+ show significant differences. Optical spectra of Kapton excited by neutral oxygen beams of less than 1 keV have been recorded.